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Remarks

Claims 1-21 are pending in this Application. Claims 1-10 and Claims 12-21 have been Rejected, and Claim 11 has been Objected to. This Amendment After Final Requests Amendment of Independent Claims 1, 4, 7, 12, 13 and 17; Cancels Claims 2, 3, 10, 11, 15 and 16; and Responds to the Examiner's Rejections and Objections. The limitations of Claim 11, which Claim was indicated as Allowable if rewritten to include the limitations of base Claim 7 have been incorporated by Amendment into Claim 7 rendering it the equivalent of previous Claim 11.

Allowable Subject Matter

Applicant gratefully acknowledges the Examiner's indication that previous Claim 11 contains Allowable Subject Matter:

Claim 11 is objected to as being dependent upon a rejected base claim but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Regarding claim 11, prior art fails to teach or make obvious a QWIP element with an energy relaxation layer interposed between a first superlattice of quantum wells and a second superlattice of quantum wells..

Applicant is Requesting the Amendment of Claims 1, 4, 7, 12 13 and 17 to incorporate the energy relaxation layer interposed between a first superlattice of quantum wells and a second superlattice of quantum wells into the Independent Claims which should obviate each and every one of the Examiner's Rejections and Objections in view of the acknowledged Allowability of the limitation.

Claim Rejection 35 U.S.C. 102(a)

The Examiner states that

Claims 12, 13, 15, and 16, are rejected under 35 U.S.C. 102(b) as being anticipated by Choi (US 5,384,469 A).

Specifically

The Examiner states that

Regarding claims 12 and 13, Choi discloses a voltage-tunable multicolor infrared

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(IR) detector element (Abstract) comprising: a substantially planar surface (22) adapted to admit light; and a means for redirecting the admitted light (redirect light into superlattice structure: col. 3, lines 60-65). Choi further discloses sides extending from the substantially planar surface, each side (sides of item 24) being substantially non-perpendicular to the substantially planar surface.

Response

Having Requested to Amend Claims 12 and 13 to limit the QWIP elements to a first and second superlattice of quantum wells separated by an energy relaxation layer, applicant believes that it has Obviated the Examiner's Rejection.

In addition, Applicant notes that it does not believe that Choi (U.S. Patent 5,384,469 A) (hereinafter Choi '469) "further discloses sides extending from the substantially planar surface, each side (sides of item 24) being substantially non-perpendicular to the substantially planar surface [22]." (**emphasis added**) The relevant portions of Choi '469 that describe semiconductor superlattice 24 (col. 3, line 52 – col. 4, line 12) taken in conjunction with Figure 1 do not disclose sides "extending from the substantially planar surface" are substantially non-perpendicular to the substantially planar surface. In fact, the sides of the semiconductor superlattice 24 intersect the surface of contact layer 23 and no relationship is disclosed between the semiconductor superlattice sides 24 and the substantially planar surface 22; however, it does appear from Figure 1 that two of the sides of the semiconductor superlattice 24 would be non-perpendicular and two sides would be perpendicular if the sides of semiconductor superlattice 24 did intersect the substantially planar surface 22. The relevant lines are included here for the Examiner's convenience:

A semiconductor superlattice structure 24 is formed on layer 23. A second conductive contact layer 25 is deposited on the surface of structure 24. Layers 23, 25 are in contact with opposite parallel surfaces of structure 24. An adjustable voltage source 29 and a series resistor 27 are connected across semiconductor structure 24 via contact layers 23, 25. A voltmeter 28 is connected across resistor 27.

The operation of detector 20 as an IR detector is as follows: IR radiation incident on face 22 passes through substrate 21 and contact layer 23 and illuminates superlattice structure 24 at an angle. Structure 24 absorbs that portion of the IR radiation having frequencies that fall within the absorption bands of structure 24. This IR absorption causes a photocurrent to flow through structure 24 and resistor 27. The amount of current flow depends on the total amount of IR radiation absorbed by structure 24. As such, voltmeter 28, which measures current flow by measuring the voltage across resistor 27, provides a measure of the amount of radiation incident on detector 20 that lies within the absorption band of structure 24.

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The absorption characteristics of superlattice structure 24 depends, among other things, on its quantum well structure. FIG. 2 illustrates the conduction band potential profile of a preferred well structure for a small portion of semiconductor structure 24. FIG. 2 illustrates a potential profile of detector 20 with voltage source 29 adjusted to zero bias.

The Examiner further states:

Regarding claims 15 and 16, Choi discloses a first and second superlattice of quantum wells each adapted to detect respectively a first and second range of wavelengths (col. 4, lines 37-40).

Applicant does not believe that the cited portion of Choi '469 discloses the elements cited by the Examiner. The relevant portion of Choi '469 is provided for the Examiner's convenience:

FIG. 2, widths W1 and W2 of the quantum wells and the widths B1 and B2 of the quantum barriers are engineered such that at zero bias, the Fermi levels E_F across the two quantum wells are substantially equal, but the ...

Claim Rejections - 35 U.S.C. § 103

The Examiner states that

Claims 1-10 and 17-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. **Two-color corrugated quantum-well infrared photodetector for remote temperature sensing.**

Specifically

The Examiner states that

Regarding claims 1, 2, 4, 7, 9, 17, 18, and 20, Chen et al. teach a tunable voltage source (page 7, paragraph 1 and page 8 changing voltages from 0.85 V to 3.5 V to -3 V) adapted to supply a positive and negative bias voltage; top contact and bottom contact (Figure 1(b)); substantially-transparent substrate (Figure 1(b)) matrix of detectors (Figure 1 (a)), each detector comprising bottom surfaces and side surfaces with each side being substantially non-parallel to an opposing side and each surface capable of reflecting incident radiation (Figure 1(b); and a first and second wavelength QWIP (page 7, paragraph 2) adapted to detect energy at first and second wavelengths (page 7, paragraph 2).

Response

Having Requested to Amend Claims 1, 4, 7, and 17 (claim 17 by specifically referencing

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the voltage tunable multi-color infrared (IR) detector element of Claim 13, which has, in turn, been requested to be Amended) to limit the QWIP elements to a first and second superlattice of quantum wells separated by an energy relaxation layer, applicant believes that it has Obviated the Examiner's Rejections since Claim 2 has been Cancelled, Claim 9 Depends from Claim 7, Claim 18 Depends from claim 17 and Claim 20 Depends indirectly from Claim 17 via intermediate Claim 18.

In addition, in regard to Claim 2, Applicant notes that Chen, *et al.* also does not disclose a blocking barrier separating a first and second quantum well; however, this is no longer relevant if the Requested Amendment After Final is Entered.

In addition, in regard to Claim 4, Applicant notes that Chen, *et al.* also does not disclose a processor being coupled to the focal plane array camera; however, this is no longer relevant if the Requested Amendment After final is Entered.

Specifically

The Examiner states that

Regarding claim 3, Chen et al. do not disclose expressly the structures being superlattices however it would have been well-known to one of ordinary skill in the art that it was conventional for QWIPs to be superlattices.

Response

Claim 3 having been Cancelled this Rejection is Obviated.

Specifically

The Examiner states that

Regarding claims 5, 6, 19, and 21 Chen et al. further teach concurrently displaying the first and second wavelength two-dimensional image (Figure 3).

Response

Having Requested to Amend Claims 4 and 17, Applicant believes that Entry of such Requested Amendment will Obviate the Examiner's Rejections since Claims 5 and 6 Depend from Claim 4 and, therefore, contain all of the limitations of Claim 4; and Claims 19 and 21 Depend indirectly from Claim 17 via intermediate Claims 18 and 18 and 20 respectively, and, therefore, contain all of the limitations of Claim 17.

Specifically

The Examiner states that

Regarding claim 8, Chen et al. do not disclose expressly the contacts being metal contacts, however it would have been obvious to one of ordinary skill

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in the art that in order to efficiently conduct electricity it would have been necessary for the contacts to have been made out of metal.

Response

Having Requested to Amend Claim 7, Applicant believes that Entry of such Requested Amendment will Obviate the Examiner's Rejection since Claim 8 Depends from Claim 7 and, therefore, would contain all of the limitations of Claim 7 as Amended.

Specifically

The Examiner states that

Regarding claim 10, Chen et al. further teach the first and second wavelength QWIP elements adapted to detect energy at first and second wavelengths (page 7, paragraph 2) and the first and second quantum wells separated by a blocking barrier (page 7, last paragraph second col.).

Response

Claim 10 having been Cancelled this Rejection is Obviated.

Specifically

The Examiner states that

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Choi (US 5,384,469 A) in view of Chen et al. **Two-color corrugated quantum-well infrared photodetector for remote temperature sensing.**

Response

Having Requested to Amend Claim 13, Applicant believes that Entry of such Requested Amendment will Obviate the Examiner's Rejections since Claim 14 Depends from Claim 13 and, therefore, would contain all of the limitations of Claim 13 as Amended.

Conclusion**Conclusion/Notice of Appeal**

Applicant believes that its Request to Enter Amendments to Claims 1, 4, 7, 12, 13 and 17; and to Cancel Claims 2, 3, 10, 11, 15 and 16 are consistent with Manual of Patent Examining Procedures paragraph 714.12 Amendments and Other Replies After Final Rejection or Action and with underlying Patent Rule 37 CFR 1.116 Amendments and affidavits or other evidence after final action and prior to appeal in that it Cancels Claims 2, 3, 10, 11, 15 and 16 and complies with the Examiner's requirement to re-write Claim 11, which was Objected to as being Dependent upon a Rejected Base Claim by requesting to Amend Base Claim 7 to incorporate each and every limitation of Claim 11. In

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addition, amending Claims 1, 4, 7, 12, 13, and 17 will place the Application in Condition for Allowance in view of the incorporation of the Allowable Subject Matter from Claim 11 into each and every Independent Claim 1, 4, 7, 12, 13 and 17. In the alternative, the Amendment of these Claims will place the Rejected Claims in better form for consideration on Appeal. Applicant is Filing a Notice of Appeal in the event that the Examiner should decide that Entry of the Requested Amendment is not warranted under 37 CFR 1.114 or in the event that the Examiner would not find the Claims Allowable as Requested to be Amended.

Applicant believes that the Amendments Requested to be Entered above Respond to each and every one of the Examiner's Rejections and Objections and are such as to place the Application into Condition for Allowance. Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

The Examiner is invited to telephone the undersigned at the local telephone number given below if, after considering this amendment, the Examiner is of the opinion that the Amendments Requested to be made have not resolved all outstanding issues in this case and brought the case into Condition for Allowance.

Respectfully submitted,

26 JANUARY 2007

DATE


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